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UNIT 1, EVIDENCE OF COMMON ANCESTRY							Instructional days: 15
Essential question: How do organisms change over time?							
Unit abstract: By the completion of this unit of study, students will understand how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students will examine evidence to support their understanding of patterns in the fossil record and how those patterns show relationships between modern organisms and their common ancestors. Students will use the practices of analyzing graphical displays and gathering, reading, and communicating information. The crosscutting concepts of cause and effect, patterns, and structure and function will support understanding across this unit of study.							
Performance Expectations Disciplinary Core Ideas		**Learning Goals (Foundation Box)**			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**	
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**			
MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	LS4.A	Analyzing and Interpreting Data	Patterns	RST.6-8.1 RST.6-8.7	6.EE.B.6	
MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	LS4.A	Constructing Explanations and Designing Solutions	Patterns	RST.6-8.1 WHST.6-8.2 SL.8.1 SL.8.4	6.EE.B.6	
MS-LS4-3	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	LS4.A	Analyzing and Interpreting Data	Patterns	RST.6-8.1 RST.6-8.7 RST.6-8.9		
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UNIT 2, SELECTION AND ADAPTATION **Instructional days: 15**

Essential question: How do organisms change over time in response to changes in the environment?

Unit abstract: Students will be able to construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species.

Students will use the practices of constructing explanations; obtaining, evaluating, and communicating information; and using mathematical and computational thinking. Crosscutting concepts of patterns and structure and function contribute to the evidence students can use to describe biological evolution will support understanding across this unit of study.

Performance Expectations Disciplinary Core Ideas		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-LS4-4	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	LS4.B	Constructing Explanations and Designing Solutions	Cause and Effect	RST.6-8.1 RST.6-8.9 WHST.6-8.2 WHST.6-8.9 SL.8.1 SL.8.4	6.RP.A.1 6.SP.B.5 7.RP.A.2
MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	LS4.B	Obtaining, Evaluating, and Communicating Information	Cause and Effect	RST.6-8.1 WHST.6-8.8	
MS-LS4-6	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	LS4.C	Using Mathematics and Computational Thinking	Cause and Effect	MP.4 6.RP.A.1 6.SP.B.5 7.RP.A.2	

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UNIT 3, STABILITY AND CHANGE ON EARTH						**Instructional days: 30**
Essential questions:	How is the availability of needed natural resources related to naturally occurring processes? How can natural hazards be predicted? How do human activities affect Earth systems? How do we know our global climate is changing?					
Unit abstract: Upon completion of this unit of study, students will understand the ways that human activities affect Earth's systems. Students will use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts on the development of these resources. Students will also understand that the distribution of these resources is uneven due to past and current geosciences processes or removal by humans. The crosscutting concepts of patterns, cause and effect, and stability and change are called out as organizing concepts for these disciplinary core ideas. In this unit of study students are expected to demonstrate proficiency in asking questions, analyzing and interpreting data, constructing explanations, and designing solutions, and they will use these practices to demonstrate understanding of the core ideas.						
Performance Expectations **Disciplinary Core Ideas**		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes	ESS3.A	Constructing Explanations and Designing Solutions	Cause and Effect	RST.6-8.1 WHST.6-8.2 WHST.6-8.9	6.EE.B.6 7.EE.B.4
MS-ESS3-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	ESS3.C	Analyzing and Interpreting Data	Patterns	RST.6-8.1 RST.6-8.7	MP.2 6.EE.B.6 7.EE.B.4
MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	ESS3.C	Engaging in Argument from Evidence	Cause and Effect	RST.6-8.1 WHST.6-8.1 WHST.6-8.9	6.RP.A.1 7.RP.A.2 6.EE.B.6 7.EE.B.4
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century	ESS3.C	Asking Questions and Defining Problems	Stability and Change	RST.6-8.1	MP.2 6.EE.B.6 7.EE.B.4

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UNIT 4, HUMAN IMPACTS ON EARTH SYSTEMS AND GLOBAL CLIMATE CHANGE **Instructional days: 23**

Essential questions: How do human activities affect Earth systems?
How will the end user decide whether or not an engineering design is successful?

Unit abstract: Students will understand the ways that human activities affect Earth's systems. Students will use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses.

The crosscutting concepts of cause and effect and the influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In this unit of study, students are expected to demonstrate proficiency in analyzing and interpreting data and designing solutions. They will also define design problems and evaluate competing design solutions to demonstrate understanding of the core ideas. The goal for middle school students is to define problems more precisely, to conduct a more thorough process of choosing the best solution, and to optimize the final design. This includes defining a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluating alternative solutions; analyzing data from tests of different solutions; combining the best ideas into an improved solution; and developing and iteratively testing and improving a model to reach an optimal solution. In earth and space science, students apply their engineering design capabilities to problems related to the impacts of humans on Earth systems.

Performance Expectations Disciplinary Core Ideas		Learning Goals (Foundation Box)			Connections to the CCSS – ELA	Connections to the CCSS – Mathematics
		Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts		
MS-ESS3-3*	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*	ESS3.C	Constructing Explanations and Designing Solutions	Cause and Effect	WHST.6-8.7 WHST.6-8.8	6.RP.A.1 7.RP.A.2 6.EE.B.6 7.EE.B.4
MS-ETS1.1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	ETS1.A	Asking Questions and Defining Problems		RST.6-8.1 WHST.6-8.8	MP.2 7.EE.3
MS-ETS1.2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	ETS1.B	Engaging in Argument from Evidence		RST.6-8.1 RST.6-8.9 WHST.6-8.7 WHST.6-8.9	MP.2 7.EE.3
MS-ETS1.3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	ETS1.B ETS1.C	Analyzing and Interpreting Data		RST.6-8.1 RST.6-8.7 RST.6-8.9	MP.2 7.EE.3

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UNIT 5, RELATIONSHIPS AMONG FORMS OF ENERGY						**Instructional days: 22**
Essential question: How can energy be transferred from one object or system to another?						
Unit abstract: Upon completion of this unit of study, students will understand the relationship between energy and forces. Students develop their understanding of important qualitative ideas about energy, including that the interactions of objects can be explained and predicted using the concept of transfer of energy from one object or system of objects to another, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students will also begin to know the difference between energy and temperature, and the relationship between forces and energy. Students will use the practices of analyzing and interpreting data, developing and using models, and engaging in argument from evidence. The crosscutting concepts of scale, proportion, and quantity; systems and system models; and energy and matter will support understanding across this unit of study.						
Performance Expectations Disciplinary Core Ideas		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	PS3.A PS3.B	Analyzing and Interpreting Data	Scale, Proportion, and Quantity	RST.6-8.1 RST.6-8.7	MP.2 6.RP.A.1 6.RP.A.2 7.RP.A.2 8.EE.A.1 8.EE.A.2 8.F.A.3
MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	PS3.A	Developing and Using Models	Systems and System Models	SL.8.5	
MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	PS3.B	Engaging in Argument from Evidence	Energy and Matter	RST.6-8.1 WHST.6-8.1	MP.2 6.RP.A.1 7.RP.A.2 8.F.A.3

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UNIT 6, THERMAL ENERGY **Instructional days: 30**

Essential questions: How can energy be transferred from one object or system to another?
How will the end user decide whether or not an engineering design is successful?

Unit abstract: Students will come to know the difference between energy and temperature. They will understand that the total change of energy in any system is always equal to the total energy transferred into or out of the system. The crosscutting concepts of energy and matter; scale, proportion, and quantity; and influence of science, engineering, and technology on society and the natural world are the organizing concepts for these disciplinary core ideas.

Science and engineering practices include constructing explanations and designing solutions, asking questions and defining problems, engaging in argument from evidence, planning and carrying out investigations, and analyzing and interpreting data. Students will be able to apply an understanding of design to the process of energy transfer. They will also define design problems, develop models, and evaluate competing design solutions to demonstrate understanding of the core ideas.

The goal for middle school students is to define problems more precisely, to conduct a more thorough process of choosing the best solution, and to optimize the final design. These include defining a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment, systematically evaluating alternative solutions, analyzing data from tests of different solutions and combining the best ideas into an improved solution, and developing a model and iteratively testing and improving it to reach an optimal solution. In physical science, students apply their engineering design capabilities to problems related to the transfer of thermal energy into and out of a system. Assessment does not include calculating the total amount of thermal energy transferred.

Performance Expectations Disciplinary Core Ideas		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*	PS3.A PS3.B	Constructing explanations and designing solutions	Cause and Effect	RST.6-8.3 WHST.6-8.7	
MS-PS3-4	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	PS3.A PS3.B	Planning and carrying out investigations	Systems and System Models	RST.6-8.3 WHST.6-8.7	MP.2 6.SP.B.5
MS-ETS1.1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	ETS1.A	Asking questions and defining problems		RST.6-8.1 WHST.6-8.8	MP.2 7.EE.3

MS-ETS1.2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	ETS1.B	Engaging in argument from evidence		RST.6-8.1 RST.6-8.9 WHST.6-8.7 WHST.6-8.9	MP.2 7.EE.3
MS-ETS1.3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	ETS1.B ETS1.C	Analyzing and interpreting data		RST.6-8.1 RST.6-8.7 RST.6-8.9	MP.2 7.EE.3
MS-ETS1.4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	ETS1.B ETS1.C	Developing and using models		SL.8.5	MP.2 7.SP
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UNIT 7, THE ELECTROMAGNETIC SPECTRUM							Instructional days: 15
Essential question: What are the characteristic properties of waves and how can they be used?							
Unit abstract: Students are able to describe and predict characteristic properties and behaviors of waves when the waves interact with matter. Students can apply an understanding of waves as a means of sending digital information. The crosscutting concepts of patterns and structure and function are used as organizing concepts for these disciplinary core ideas. The performance expectations in PS4 focus on students demonstrating proficiency in developing and using models; using mathematical thinking; and obtaining, evaluating, and communicating information and using these practices to demonstrate understanding of the core ideas.							
Performance Expectations Disciplinary Core Ideas		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**	
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**			
MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	PS4.A	Using Mathematics and Computational Thinking	Patterns	SL.8.5	MP.2 MP.4 6.RP.A.1 6.RP.A.3 7.RP.A.2 8.F.A.3	
MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	PS4.A PS4.B	Developing and Using Models	Structure and Function	SL.8.5		
MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	PS4.C	Obtaining, Evaluating, and Communicating Information	Structure and Function	RST.6-8.1 RST.6-8.2 RST.6-8.9 WHST.6-8.9		
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